RESPONSE ACTION MEMORANDUM

Site:
Proposed Home Depot Development
Alakawa Street
Honolulu, Oahu, Hawaii

Prepared by:
Charley Langer
Remedial Project Manager
Hazard Evaluation and Emergency Response Office
(808) 586-4249

June 18, 1999

PART I: STATEMENT OF APPROVAL

1.0 INTRODUCTION

This response action memorandum (RAM) presents the remedial alternative selected by the State of Hawaii Department of Health (DOH) Hazard Evaluation and Emergency Response (HEER) Office for the proposed Home Depot development located in the Iwilei District, City and County of Honolulu, Hawaii. The RAM summarizes pertinent site information, documents the basis for remediation, and describes the rationale for selecting the remedial alternative. The RAM is based on the site characterization, risk assessments, and analysis of remedial action alternatives (ARAA) prepared by Alton Geoscience and GeoSyntec Consultants on behalf of Home Depot U.S.A., Inc.

2.0 ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this RAM, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

3.0 DESCRIPTION OF THE SELECTED REMEDY

The selected remedy addresses soil, soil gas, and groundwater at the proposed Home Depot development, which have been contaminated by petroleum and related constituents, polynuclear aromatic hydrocarbons, and methane. Benzene and benzo(a)pyrene are the primary contributors to site risk. While not considered toxic, methane is of concern at the site due to the potential for fire and explosions.

Reported soil concentrations of benzene range from below laboratory detection limits to a maximum of 740 milligrams per kilogram (mg/kg); concentrations of benzene in water were reported to range from below laboratory detection limits to a maximum of 119.6 milligrams per liter (mg/l). Benzo(a)pyrene was reported in soil at concentrations ranging from below laboratory detection limits to a maximum of 220 mg/kg. Methane concentrations in soil vapor were reported to range from the laboratory detection limit to a maximum of approximately 43 percent.

Active treatment of the contamination was determined to be impracticable based on effectiveness, implementability, and cost factors. The reasons for this determination are further elaborated herein and in the ARAA. While treatment to reduce permanently and significantly the mobility, toxicity, and volume was found to be impracticable, the selected remedy is designed to protect the public and environment through engineered controls, continued monitoring, and any necessary maintenance.

The selected remedy will consist of installing a vapor control system over the entire site, and groundwater monitoring. Unlike the other alternatives considered, the primary intent of this remedy is to protect human health, rather than remediate soil and groundwater. The vapor control system will be comprised of a cap consisting of a geomembrane and soil cover, and an extraction system to vent vapors that may accumulate beneath the proposed development. The gas control system will be designed to prevent vapors from migrating onto the site from offsite sources. Because this alternative does nothing to prevent exposure to construction workers involved with site development, institutional controls will be implemented to ensure worker safety. Institutional controls will consist of preparing and implementing a Risk Management Plan and a Construction Health and Safety Plan.

4.0 DECLARATION

The selected remedy is protective of human health and the environment, complies with federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. Subject to the limitations described in Section 3.0 above, the remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

GARY GILL
Deputy Director for Environmental Health

Date

PART II: DECISION SUMMARY

1.0 SITE LOCATION AND DESCRIPTION

1.1 Site Location

The proposed Home Depot development (the site) is located south of Alakawa Street in the Iwilei District of Honolulu, across Nimitz Highway from the Honolulu Harbor (Figure 1). The approximate geographic coordinates of the site are 21°19'30" N, 157°30" W.

1.2 Site Description

The site consists of approximately 8.9 acres of vacant land owned by Castle & Cooke (Figure 2). It is relatively flat and at an elevation of approximately 5 feet above mean sea level (MSL). Groundcover on the site is predominantly soil with small amounts of vegetation. The proposed development includes a Home Depot store and associated multilevel parking structure (Figure 2).

Results from environmental investigations indicate petroleum and related constituents, polynuclear aromatic hydrocarbons (PAHs), and methane have contaminated soil, soil gas, and groundwater at the site. The petroleum contamination at the site is apparently part of an area-wide problem that is currently under investigation by the HEER Office and a work group made up of potentially responsible parties. While offsite impacts are not well understood, the nature and extent of contamination at the site have been adequately defined to evaluate site-related risks to human health and the environment, and to evaluate applicable remedial alternatives.

1.3 Adjacent Land Uses

The site is located in a mixed commercial/light industrial area of the Iwilei District. It is bordered by Alakawa Street to the northwest, Castle & Cooke property to the northeast, vacant former Honolulu Gas Company property to the south and east, a Unocal petroleum storage facility to the southeast, and Weyerhaeuser to the southwest. Across Alakawa Street to the north lies other Castle & Cooke property, which includes the tenants of Cannery Row.

1.4 Natural Resource Uses

1.4.1 Surface Water

The Kapalama Drainage Canal is located approximately 1,600 feet north of the site. The Kapalama Drainage Canal discharges into Kapalama Basin, and ultimately into Keehi Lagoon located approximately 1 mile west of the site. None of these waters are used as a drinking water supply. Keehi Lagoon is a wetlands known to be inhabited by three federally designated endangered species: the Hawaiian Gallinule (aka: Moorhen, *Gallinula chloropus sandvicensis*), the Hawaiian Duck (*Anas wyvilliana*), and the Hawaiian Stilt (*Himantopus mexicanus knudseni*).

There is modest commercial fishing in the ocean waters within 15 miles of the site. In 1995, commercial fishermen in these waters landed approximately 72,000 pounds of fish.

1.4.2 Groundwater

Groundwater immediately beneath the site occurs under unconfined conditions within the stratified sedimentary deposits along Oahu's southern coast. These coastal sediments are locally known as "caprock" because they are relatively impermeable compared to the underlying basalt. The groundwater body in the caprock is in contact with the ocean, and consequently is brackish to salty. This type of groundwater is not currently used as a drinking water source. The caprock groundwater beneath the site appears to be flowing toward the Kapalama Drainage Canal.

The basaltic rock beneath the caprock is part of the Honolulu basal aquifer, which serves as a drinking water source. Leakage between the caprock and the basal aquifer is upward since the basal aquifer is under artesian conditions. Thus, the basal aquifer has low vulnerability to contamination. The expected flow direction of the basal groundwater beneath the site is toward the Honolulu Harbor.

1.5 Location and Distance of Human Populations

There are approximately 50 workers in the Dole Cannery commercial center, which is located approximately 800 feet from the area of contamination at the site. The nearest residence is located approximately 1000 feet to the east of the site, and approximately 50,000 people live within one mile of the site.

2.0 SITE HISTORY

2.1 Site Activities

The site is part of a larger holding by Castle & Cooke upon which the former Dole Cannery was operated from the early 1900s until the late 1980s. The entire Dole facility included a cannery, a can manufacturing plant, warehouses, and office buildings. Primary operations consisted of packing fresh pineapples, and canning and freezing pineapple products. These processes also generated marketable byproducts such as heavy pineapple syrup and cattle feed from the pineapple shell.

Operations at the site primarily consisted of the processing of pineapple bran and juices, and warehousing. Auxiliary operations also included the underground piping of fuels, heat and power generation from fuels, maintenance of machinery, operation of a railroad track, packaging, and warehousing of raw materials or pineapple shipments. The railroad track was located on the north side of the site. The north corner of the site was part of a former vehicle-maintenance area, and part of the Label Building was located at the west corner. (Brewer, 1993)

2.2 Adjacent Facilities

Facilities of concern adjacent to the site include other portions of the former Dole Cannery facility, Honolulu Gas Company, the Unocal petroleum storage facility, and Weyerhaeuser. In addition to Unocal, several other major oil companies have operated and continue to operate large petroleum storage and distribution facilities in the Iwilei district, including an extensive network of underground piping.

Although currently vacant, the Honolulu Gas Company facility was a petroleum gasification plant where heavy oil and parafinic residual feedstocks were reportedly thermally cracked to create petroleum gas. The gas and byproducts, including tars, benzene, toluene, and xylenes, were stored in aboveground tanks, and distributed via underground pipelines. The migration of contaminants released to the environment at and around the Honolulu Gas Company property, including the site, appears to have been influenced by the injection of waste water into two wells (Ecology and Environment, Inc., 1990). The Unocal facility has stored various petroleum products in aboveground tanks and distributed the fuels via both trucks and underground pipelines. The Weyerhaeuser facility has been a cardboard box manufacturing facility, but has had problems with underground tanks (Ogden, 1995b).

2.3 Site Investigations

Since 1992, approximately 40 soil gas samples, 7 flux chamber samples, 117 soil samples, and 34 groundwater samples have been collected during various environmental investigations in an effort to describe the nature and extent of environmental impacts at the site. Results of these investigations performed are summarized in Section 4.0.

Environmental assessments of the site include:

- Underground Storage Tank Removal, 2,000 gallon Boiler Fuel Tank; Brewer Environmental Services (Brewer, 1992).

- Soil Gas Sampling, Castle and Cooke Iwilei Properties, Ogden Environmental and Energy Services (Ogden, 1995a).

- Phase II Environmental Site Assessment, Limited Soil and Groundwater Sampling (Ogden, 1995b).

- Groundwater Investigation: Monitor Well Installation and Groundwater Monitoring and Sampling (Brewer, 1997a).

- Site Investigation Report for a Portion of the Former Dole Cannery Site, Iwilei District (Alton Geoscience, 1997b).

- Human Health Risk Assessment (Alton Geoscience, 1998a)

- Site Characterization Report (Alton Geoscience, 1998b)

- Potential Ecological and Human Health Risks from Groundwater (Alton Geoscience, 1998c)

- Analysis of Remedial Action Alternatives (GeoSyntec Consultants, 1998).

2.4 State Regulatory Involvement

2.4.1 Honolulu Harbor Area-Wide Contamination Project

In 1994, the HEER Office determined that Honolulu Harbor, including the Iwilei area in which the site is located, required investigation for area-wide petroleum contamination. DOH believed the investigation should be conducted through a cooperative effort with potentially responsible parties (PRPs) for the sake of effectiveness and efficiency. In late 1995, the HEER Office divided the harbor into four units to better address the project. The Iwilei unit, bounded by Dillingham Boulevard and Kapalama and Nuuanu Streams, was chosen as a starting point due to releases from Pier 26, vapor explosions, termination of leases in the area, federal interest, and proposed redevelopment of the pier area.

In 1996, the Department of Transportation - Harbors Division (DOT) began preliminary investigative work into contamination of the properties that it owns. In early 1998, an agreement was signed by and between BHP Companies (on behalf of GASCO, Inc., BHP Petroleum Americas Refining, and Petroterm Inc.), Chevron Products Company, Hawaiian Electric Company, Shell Oil Products Company, Tosco Distribution Company/Union Oil Company of California dba Unocal, and DOT (collectively called, “the Participating Group”) and DOH. Under the agreement, the Participating Group will pay for investigation of the Honolulu Harbor area, and will be given a two-for-one credit against DOH oversight costs. A phased environmental investigation and remediation is planned over the next 5 to 10 years.

2.4.2 Voluntary Response Program

After an initial meeting with the HEER Office in August 1997 to discuss environmental issues related to the proposed development of the site, Home Depot requested consideration of their application to the Hawaii Voluntary Response Program (VRP). The VRP law provides relief from certain liabilities for eligible parties who have not contributed to existing conditions on a specific site, who desire to acquire an interest in that site as an owner or operator, and who conduct an adequate DOH-approved response action. The relief from liability applies to the media, land areas, and contaminants cleaned up to a risk-based standard of not more than 1×10^{-6}.

Home Depot's application to the VRP was approved in March 1998. Home Depot and DOH subsequently entered into an agreement which requires Home Depot to (1) ensure that the site is adequately characterized to support a risk assessment, (2) evaluate potential risks to human health and the environment, (3) screen and evaluate applicable remedial alternatives, and (4) implement an appropriate response action for the site.

2.4.3 HEER Office Oversight

In August and September 1997, a summary of previous investigations and a work plan for a human health risk assessment was submitted to the HEER Office. Under the direction and approval of the HEER Office, additional soil and groundwater sampling was performed at the site. An initial human health risk assessment was submitted to the HEER Office in January 1998, and a risk assessment to further evaluate potential impacts from groundwater was submitted to the HEER Office in March 1998. Based on the HEER Office's comments, revised risk assessment documents were prepared and submitted. A site characterization report was submitted to the HEER Office on June 17, 1998 and approved on July 20, 1998. The initial human health risk assessment was subsequently approved on September 16, 1998, and the risk assessment to further evaluate potential impacts from contaminated groundwater was approved on November 26, 1998. GeoSyntec Consultants performed an analysis of remedial action alternatives (ARAA), which was approved by the HEER Office on December 5, 1998.

2.5 Federal Regulatory Involvement

The United States Coast Guard (USCG) has taken enforcement actions against PRPs in the Honolulu Harbor area for petroleum releases into the harbor due to seepages of contaminated groundwater. However, there has been no direct involvement at the site by the USCG, the Environmental Protection Agency (EPA), or other federal regulatory agencies to date.

3.0 SITE CHARACTERISTICS

3.1 Hazardous Substance Sources

Potential sources of hazardous substance contamination associated with the site include:

- *Onsite storage, conveyance, and use of petroleum.* Dole formerly operated petroleum underground storage tanks (USTs) and pipelines, and used petroleum products for heating, generating power, and maintaining machinery and vehicles. Analyses of soil and groundwater samples collected near such potential sources indicated the presence of petroleum, petroleum-related constituents, and PAHs. (Petroleum-related constituents include benzene, toluene, ethylbenzene, and xylenes [BTEX]. PAHs, such as benzo(a)pyrene, are constituents of "heavier" petroleum products [e.g., middle distillates, residual fuels, and lubricants], but are also formed during the incomplete combustion of petroleum and other organics.)

- *Offsite storage, conveyance, and use of petroleum*. Adjacent and vicinity properties have been used for petroleum bulk storage, distribution, and refining. Other nearby facilities have operated petroleum USTs. Analyses of soil and groundwater samples indicated the presence of petroleum and other hazardous substances at the site which may have originated from such offsite sources. In particular, it has been noted that petroleum, petroleum-related constituents, and PAHs were generally detected at their highest concentrations near the hydrogeologically-upgradient property boundary of the site (Alton Geoscience, 1997b).

3.2 Nature and Extent of Contamination

A summary of chemical analyses (including the number of samples, contaminants detected, number of detections, minimum concentrations, and maximum concentrations for each media) is presented in the following text and in the attached Table 1.

3.2.1 Petroleum Hydrocarbons

Based on the results of simulated distillation analyses and field observations, the contaminants at the site appear to be comprised of a mixture of petroleum hydrocarbons. Simulated distillation analyses are indicative of crude oil for a sample collected in the central portion of the site. Samples collected on the site but near the Honolulu Gas Company site and the Unocal terminal are indicative of a mixture of diesel fuel and gasoline (Ogden, 1995b, Alton Geoscience, 1997b).

Total petroleum hydrocarbons (TPH) in soil were reported to range from below laboratory detection limits to a maximum of 17,100 milligrams per kilogram (mg/kg), 30,700 mg/kg, and 5,000 mg/kg for the gasoline, diesel, and oil ranges, respectively. Reported TPH in groundwater ranged from below laboratory detection limits to a maximum of 17,100 milligrams per liter (mg/l), 30,700 mg/l, and 5,000 mg/l for the gasoline, diesel, and oil ranges, respectively.

The petroleum constituents of greatest concern are the aromatic hydrocarbons (e.g., BTEX), which were generally detected in highest concentrations on the eastern half of the site near the boundary of the neighboring Honolulu Gas Company property and the Unocal terminal. Reported soil concentrations of benzene, one of the two primary contributors to site risk (see Section 4.0), ranged from below laboratory detection limits to a maximum of 740 mg/kg. Concentrations of benzene in water were reported to range from below laboratory detection limits to a maximum of 119.6 mg/l.

3.2.2 Polynuclear Aromatic Hydrocarbons

PAHs were detected at their highest soil concentrations on the east half of the site near the boundary of the neighboring Honolulu Gas Company property. Benzo(a)pyrene, the other primary contributor to site risk (see Section 4.0), was reported at concentrations ranging from below laboratory detection limits to a maximum of 220 mg/kg. Lower concentrations were detected in the south corner of the site. Elevated PAH concentrations in soil appear to extend further westward from the Honolulu Gas Company property into the center of the site than the TPH and aromatics. Samples from other areas of the site were generally below laboratory detection limits for these contaminants.

3.2.3 Methane

Methane was detected during a soil gas survey performed at the site in 1994 (Ogden, 1995a). Methane concentrations range from the laboratory detection limit to a maximum of approximately 43 percent. The concentrations of methane detected by Ogden were confirmed by Alton Geoscience (Alton Geoscience, 1998b). The highest methane concentrations were generally detected on the boundary with the neighboring Honolulu Gas Company property and the Unocal terminal. However, methane was also detected in the central portion of the site. Some of the high concentrations of methane correspond to the approximate location of the sanitary sewer.

The source of methane has not been defined but may be due to the decay of natural organic material, the decay of pineapple waste, the decay of petroleum hydrocarbons, or from leaks associated with the sanitary sewer that traverses the site. Methane is not regulated as a toxic substance and has not been included in the risk assessment. However, when methane concentrations approach 5 percent, there is a potential for fires and explosions due to the build-up of methane beneath structures, in pipes, and in conveyance systems such as sewer lines or storm drains.

3.2.4 Halogenated Volatile Organic Compounds

Several soil and groundwater samples were analyzed for halogenated volatile organic compounds (HVOCs). HVOCs have not been detected in any samples at concentrations exceeding action levels with the exception of one sample. Soil sample B4-S3 contained methylene chloride, a common laboratory contaminant, at a concentration of 0.072 mg/kg. The DOH Tier I Soil Action Level for methylene chloride is 0.003 mg/kg. Methylene chloride was not detected in any other samples (Alton Geoscience, 1997b). HVOCs were not further evaluated due to the infrequency of detection and relatively low concentrations.

3.2.5 Summary of Extent of Contamination

Based on the contaminants detected above action levels, the zone of contamination at the site has been approximately defined as shown on Figure 1. This zone encompasses the southeastern half of the site. The extent of contamination located upgradient of the site has not been defined. Based on the direction of groundwater flow, the contamination could have originated from both onsite and upgradient offsite sources.

4.0 SUMMARY OF SITE RISKS

This summary of potential risks to human health and the environment is based on the results of the risk analyses performed at the site (Alton Geoscience, 1998a and 1998c).

4.1 Receptors and Pathways

The receptors of concern include construction workers, employees, and customers of the proposed Home Depot development, offsite pedestrians and commercial workers, and offsite ecological receptors. It was assumed by the duration of exposure that, if any potential exposure were acceptable to employees, then the exposure would also be acceptable to customers. No other receptors associated with the proposed Home Depot development were considered to be at risk.

Potential pathways of exposure to construction workers include inhalation of vapors and fugitive dust, incidental ingestion, and dermal contact. Potential pathways of exposure to employees include inhalation of vapors that may migrate through the concrete floors of the Home Depot store and parking structure. Potential pathways of exposure to offsite receptors are inhalation of vapors that may migrate offsite during construction activities, inhalation and dermal contact with contaminants during offsite construction in Alakawa Street, and transport of contaminants in groundwater to the Kapalama Canal. All other pathways were considered to be incomplete and were not evaluated further.

4.2 Contaminants of Potential Concern

Based on the toxicity assessment, the contaminants of potential concern (COPCs) evaluated in this risk assessment include the following fuel-related hydrocarbons and PAHs: BTEX, isopropylbenzene, n-butylbenzene, n-propylbenzene, sec-butylbenzene, tert-butylbenzene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, anthracene, acenaphthene, fluoranthene, naphthalene, 2-methylnaphtalene, phenanthrene, and pyrene.

The COPCs have been detected in soil and/or groundwater at the site at concentrations exceeding DOH action levels. The source of these contaminants has not been determined.

4.3 Potential Risks

4.3.1 Baseline Conditions

Based on flux chamber samples collected at the site, there appears to be an insignificant excess cancer risk (i.e., 4×10^{-8}) and non-cancer hazard (i.e., 0.0023) to human health under current site conditions. Since the areas where the flux chamber samples were collected are unpaved, the data are believed to be representative of conditions where vapors are not confined. It is anticipated that after the site is paved, vapors in the subsurface will equilibrate with contaminated soil and groundwater, and as a result, increase to concentrations higher than those detected by the flux chambers. In addition, construction workers involved in grading and/or trenching operations may be exposed to higher vapor concentrations as a result of disturbing contaminated soil.

4.3.2 Construction Workers

Based on a reasonable maximum exposure scenario, the estimated excess cancer risk at the site, due primarily to benzene and benzo(a)pyrene in soil and/or groundwater, is 2×10^{-5} for workers involved in the construction of the proposed building. This falls within the 1×10^{-4} to 1×10^{-6} risk range allowable under the State Contingency Plan (SCP), but exceeds the 1×10^{-6} threshold allowable under the VRP. The estimated non-carcinogenic hazard index, due primarily to inhalation of benzene vapors, is estimated at 19.5. This exceeds the 1.0 threshold, indicating that there is potential for non-carcinogenic effects.

Construction workers may encounter COPCs while performing subsurface work such as installing utilities or building foundation components. Potential risks to construction workers could be mitigated by proper planning, training, and the use of personal protective equipment (PPE).

4.3.3 Home Depot Employees and Customers

Based on a reasonable maximum exposure scenario, the estimated excess cancer risk at the site, due primarily to benzene vapors from contaminated groundwater, is 2×10^{-5} for indoor employees. Again, this falls within the 1×10^{-4} to 1×10^{-6} risk range allowable under the SCP, but exceeds the 1×10^{-6} threshold allowable under the VRP. The estimated non-carcinogenic hazard index, again due primarily to inhalation of benzene vapors, is acceptable at 0.40.

Future employees could inhale benzene vapors that may migrate through the concrete slab of the proposed Home Depot store. It is assumed that the risk to customers would be much less, due to a shorter exposure period.

4.3.4 Offsite Receptors

Based on the results of air dispersion modeling, there appears to be an acceptable excess cancer risk (i.e., 5×10^{-8}) and non-cancer hazard (i.e., 0.15) to offsite pedestrians and commercial workers during subsurface construction activities.

4.3.5 Ingestion of Groundwater

The first encountered groundwater beneath the site is brackish and has been classified as replaceable and nonpotable. Drinking water wells in the area draw groundwater from a basal aquifer that is located at a depth of at least 600 feet below land surface. Groundwater in the basal aquifer flows predominantly upward into the overlying caprock. No drinking water wells were identified within a one-half mile radius of the site. Because of the upward groundwater flow from the potable aquifer to the nonpotable aquifer, the location of the nearest groundwater wells, and the background quality of groundwater, the potential for domestic use/ingestion of groundwater that may migrate from the site is extremely unlikely.

4.4 Ecological Risks

The Kapalama Canal is located approximately 1,600 feet downgradient of the site and is the nearest surface water body. Groundwater quality monitoring data collected since the end of 1994 appear to indicate that the hydrocarbon groundwater plume is currently stable. Based on the results of the fate and transport analysis, there is a low likelihood that any contaminants from the site would be transported in groundwater to the Kapalama Canal under current conditions. Since the source areas are not well characterized, it is possible that current conditions may change, causing the plume to migrate.

5.0 EVALUATION OF REMEDIAL ALTERNATIVES

The evaluation of remedial action alternatives presented in the following section is based on the analysis of remedial action alternatives (ARAA) (GeoSyntec Consultants, 1998).

5.1 Identification and Screening of Technologies

The Remedial Action Objectives (RAOs) and General Response Actions (GRAs) are defined in the following section. This section also includes a screening of technology types and process options.

5.1.1 Remedial Action Objectives

RAOs are medium-specific goals for protecting human health and the environment. In summary, the RAO for benzene in either soil or groundwater is to prevent the inhalation of benzene vapors by construction workers and future Home Depot employees. Inhalation by construction workers may occur when connecting new utilities to existing subsurface utilities. Based on discussions with construction managers for the proposed development, this activity is anticipated to occur when connecting to the sanitary sewer located on the south-central portion of the site.

The RAO for benzo(a)pyrene in soil is to prevent dermal contact and incidental ingestion by construction workers. Construction workers have the potential to ingest or come into direct contact with benzo(a)pyrene-contaminated soil when performing subsurface work. Levels of benzo(a)pyrene in groundwater pose no threat to human health or the environment.

Based on the assumption of the stable hydrocarbon plume, there appears to be no complete pathway to ecological receptors. In the event that plume migration is observed, the RAO to protect ecological receptors is to prevent the migration of petroleum compounds to surface water bodies such as the Kapalama Canal.

5.1.2 General Response Actions

General response actions (GRAs) are selected to satisfy the remedial action objectives for each medium of concern. The GRAs for soil include excavation, soil vapor extraction, containment, and institutional controls.

Applicable treatment technologies or process options for excavation include offsite disposal, ex-situ bioremediation, and thermal desorption. Applicable treatment technologies for soil vapor extraction include catalytic or thermal oxidation, and vapor phase carbon. Applicable treatment technologies for containment include the installation of horizontal or vertical barriers to control the migration of contamination. Applicable institutional controls to protect construction workers at the site would include the preparation and implementation of a Health and Safety Plan.

The GRAs for groundwater include groundwater monitoring, soil vapor extraction, pump and treat, containment, and institutional controls.

Groundwater monitoring would be performed to track trends in the concentrations of volatile organic compounds to evaluate whether the hydrocarbon plume is stable. Groundwater would also be monitored for constituents that are indicators of natural attenuation.

Applicable treatment technologies for pumping and treating groundwater include carbon adsorption, air stripping, and ultraviolet (UV)/chemical oxidation. Applicable process options for soil vapor extraction include air sparging, re-injection, and dual phase extraction. Applicable treatment technologies for soil vapor extraction include catalytic or thermal oxidation, and vapor phase carbon. Applicable treatment technologies for containment include the installation of horizontal or vertical barriers to control the migration of free product and dissolved phase constituents in the groundwater. Applicable institutional controls to protect construction workers involved in development of the site would include the preparation and implementation of Worker Health and Safety Plans.

5.2 Development and Screening of Alternatives

To develop remedial alternatives, GRAs are combined using various technologies applicable to different volumes of media or areas of the site to meet all RAOs. Remedial alternatives were developed based on the no action, source control, and permanent remedy alternatives.

5.2.1 No Action Alternative

The no action remedial alternative would consist of performing no remedial action, source control, or institutional controls at the site. Although the current potential risks at the site are within acceptable risks according to USEPA and the Hawaii DOH, the potential risk does not comply with the criteria specified in the Voluntary Response Program. The no action alternative would consist of air monitoring and/or groundwater monitoring.

5.2.2 Source Control

Source control remedial alternatives consist of methods that would be implemented to remove or control specific hot spots or source zones of contamination. In addition, source control remedial alternatives would include methods that would disallow the migration of contamination whether it is in the solid, liquid or vapor phase. Source control alternatives include excavation and groundwater pump and treat, soil vapor extraction, installation of vertical barrier or slurry wall, and vapor control system.

Soil contaminated with benzene and benzo(a)pyrene occur along the southern property boundary. These soils are the major component of the theoretical risk calculated using conservative assumptions. If these soils were removed, the risk to construction workers and future employees would be lowered to a level less than one in a million incremental cancer risk. Excavated soil could be treated ex-situ by either bioremediation, thermal desorption, or offsite disposal.

Soil vapor extraction (SVE) could be implemented to remediate soil and groundwater at the site. Soil remediation would be readily accomplished because a continuous stream of air would serve to flush the soil pores in the vadose zone. Groundwater remediation using SVE would be primarily effective in the capillary fringe. Air sparging is a means to increase the effectiveness of groundwater remediation using SVE technology. Air sparging consists of injecting air beneath the water table. The injected air increases the ability for contaminants in groundwater to volatilize into the vadose zone where the vapors are extracted by an SVE system. Air sparging requires minor modifications and additional equipment and conveyance piping for the SVE system. Air sparging can be easily implemented on undeveloped sites. SVE would be ineffective in remediating benzo(a)pyrene in soil. Because benzo(a)pyrene is only a concern to construction workers, it could be managed with worker health and safety plans.

A vertical barrier consisting of a geomembrane or slurry wall could decrease the potential for contaminated groundwater and vapors to migrate onto the site. Based on the direction of groundwater flow, the slurry wall would be installed along the southern property boundary adjacent to the former Honolulu Gas Company and the Unocal fuel terminal. The vertical barrier would be effective at reducing the influx of free product and shallow groundwater. However, contaminated groundwater could continue to flow onto the site beneath and around the ends of the barrier. To minimize such flow and the potential for the barrier wall to push contamination into uncontaminated areas, a pump and treat system could be installed upgradient of the vertical barrier.

The horizontal barrier would consist of a vapor control system. Unlike the other alternatives described herein, the primary purpose of the vapor control system is to protect human health rather than remediate soil and groundwater. A vapor control system would consist of a cap covering the entire site, horizontal extraction piping, and horizontal inlet piping. The cap would consist of one or more of the following elements: soil cover, horizontal geomembrane, and asphalt or concrete cover. Gas extraction piping would be installed to facilitate the removal of vapors that may accumulate beneath the structures of the proposed development. Extracted vapors would be treated using either vapor-phase carbon, or catalytic or thermal oxidation.

5.2.3 Permanent Remedy

Because the upgradient extent and source of contamination is undefined, the implementation of a permanent remedy would require either an area-wide coordinated effort including surrounding property or onsite remediation in conjunction with a vertical barrier wall integrated with groundwater pumping for hydraulic control.

A vertical barrier wall could be installed along the southern property boundary to prevent shallow groundwater contamination from migrating onto the site and to eliminate the influx of free product floating on the top of the water table. A groundwater pump and treat system installed upgradient of the vertical barrier could control potential deleterious variations in the hydraulic gradient. Pumped groundwater would be treated and discharged. Groundwater pumped from upgradient of the barrier will originate almost entirely from offsite. Free product could be skimmed from the upgradient wells.

5.3 Detailed Evaluation of Remedial Alternatives

Each remedial alternative was evaluated based on effectiveness, implementability, and cost (Table 2). The effectiveness of each alternative was evaluated based on the potential to minimize residual risks; provide long-term, reliable protection to the public and to comply with applicable requirements, namely protection of human health; minimize short term impacts; and to achieve such protection in a timely manner. The implementability of each alternative was evaluated based on the availability of the technology required and the alternative's administrative feasibility including permitting and logistical matters. In addition, community acceptance of each alternative was considered. The cost of each alternative was evaluated based on the capital costs for construction and equipment as well as long-term costs for operation and maintenance over the 25-year term of Home Depot's lease of the site.

5.3.1 Alternative 1: Groundwater Monitoring

The groundwater monitoring alternative represents the "no action" alternative. Groundwater monitoring would consist of collecting water samples from wells located across the site to monitor for contaminant migration. This alternative is implementable but would not be effective in reducing the potential risk to future employees from the inhalation of benzene nor would it eliminate the potential for vapors to migrate to adjacent properties.

The advantages of groundwater monitoring are: 1) groundwater quality data can indicate whether the hydrocarbon plume is migrating; 2) it may serve to validate the results of groundwater modeling simulations; 3) it may serve to support monitored natural attenuation as an effective remedial technology; and 4) it is the least expensive alternative.

The disadvantages of groundwater monitoring are: 1) if the hydrocarbon plume is unstable and migrating, it will do nothing to remediate groundwater; 2) it will do nothing to reduce the concentration of contaminants at the site; and 3) it is not an active mitigation method.

5.3.2 Alternative 2: Remove Soil and Groundwater Hot Spots, Install Vertical Barrier, Operate Groundwater Pump and Treat System

This alternative represents a “source control” alternative. This alternative also includes groundwater monitoring. Soil contaminated with benzene and benzo(a)pyrene in areas specified as “hot spots” in the risk assessment would be excavated and treated offsite. Groundwater and free product removed during excavation operations would be treated and discharged under a National Pollutant Discharge Elimination System (NPDES) permit. A vertical barrier consisting of a geomembrane would be installed to a depth of approximately 6 ft below grade along the southern property boundary. Groundwater would also be pumped from upgradient of the vertical barrier to extract free product that may accumulate against the barrier and decrease the potential for contaminated groundwater to flow beneath and around the ends of the barrier.

The advantages of this alternative are: 1) it is implementable and would be effective for the site; 2) it would be protective of human health and the environment; 3) it would prevent free product from migrating onto the site; and 4) it would focus remediation efforts in the hot spots which appear to pose the most potential risk to human health and act as sources for groundwater contamination.

The disadvantages of this alternative are: 1) removing groundwater and free product upgradient of the vertical barrier may substantially impact site conditions on adjacent properties; 2) if upgradient responsible parties initiated groundwater/free product remediation, the vertical barrier may hinder recovery efforts; 3) if a treatment system is installed using existing data, the treatment system may be undersized and not capable of handling a higher flux of contamination if concentrations increased; 4) the effectiveness of groundwater pumping to prevent contaminated groundwater from migrating beneath a vertical barrier is uncertain; and 5) the quantity of groundwater that would have to be pumped upgradient of the barrier to reduce contaminant migration onto the site is potentially very large and may pose significant handling and treatment problems.

5.3.3 Alternative 3: Install and Operate Vapor Control/Monitoring System and Implement Institutional Controls

This alternative represents a “source control” alternative. This alternative would consist of installing a vapor control system over the entire site. The vapor control system would be comprised of a cap consisting of a geomembrane and soil cover, and an extraction system to vent vapors that may accumulate beneath the proposed development. This alternative also includes groundwater monitoring. Unlike the other alternatives, the primary intent of this alternative is to protect human health rather than remediate soil and groundwater. The gas control system would be designed to prevent vapors from migrating onto the site from offsite sources. Because this alternative does nothing to prevent exposure to construction workers involved with site development, institutional controls would need to be implemented to ensure worker safety. Institutional controls would consist of the preparation and implementation of a Risk Management Plan and a Construction Health and Safety Plan.

The advantages of the vapor control barrier are: 1) it is implementable and a proven technology that would be effective for the site; 2) it would be protective of human health from exposure to benzene or from fire and explosion hazards due to methane regardless of the subsurface conditions at the site; 3) it would prevent vapors from migrating onto the site from offsite sources; 4) it may enhance bioremediation and initiate passive remediation of hydrocarbons beneath the parking lot, and 5) it would not impact future remedial efforts by offsite parties.

The disadvantages of the vapor control barrier are: 1) it would not actively remediate soil and/or groundwater at the site; 2) future improvements or subsurface work that have the potential to damage or compromise the integrity of the vapor control system must be carefully monitored; and 3) if groundwater monitoring data indicate that the hydrocarbon plume is moving, the vapor control system would be ineffective at slowing or stopping contaminant migration.

5.3.4 Alternative 4: Perform Soil Vapor Extraction and Air Sparging

This alternative represents a "source control" alternative. The use of active soil vapor extraction (SVE) and air sparging would attempt to remediate the site using proven technology. This alternative also includes groundwater monitoring. Vapor extraction wells would be installed in the area of contamination and air inlet wells would be installed along the perimeter of the site. The SVE system would enhance natural bioremediation while extracting hydrocarbon vapors which would decrease the level of soil contamination beneath the site. Air inlet wells could be designed to short-circuit vapors that may migrate onto the site from upgradient sources. In addition, this remedial alternative would not inhibit potential remedial measures implemented by upgradient parties.

The advantages of this alternative are: 1) the SVE/air sparging alternative is implementable and a proven technology that would be effective at the site; 2) SVE would be effective for the volatile constituents in soil; 3) the combination of SVE and air sparging would be effective in extracting and treating contaminated groundwater; and 4) the combined system would be protective of human health and the environment during its operation.

The disadvantages of this alternative are: 1) contaminated groundwater would continue to migrate onto the site; 2) it would be ineffective at remediating soil impacted with crude oil and heavy hydrocarbons; 3) the existence of an SVE/air sparge system would burden site development operations; and 4) the operation and maintenance of an SVE system would restrict retail operations of the proposed development.

5.3.5 Alternative 5: Remove All Soil Exceeding DOH Tier I Levels, Install Vertical Barrier, Operate Groundwater Pump and Treat System

This alternative represents the "permanent remedy" alternative. This alternative consists of removing all soil and groundwater impacted with contaminants at concentrations exceeding DOH Tier I Levels. This alternative also includes groundwater monitoring. Contaminated soil would be excavated and treated offsite. Groundwater and free product removed during excavation operations would be treated and discharged under an NPDES permit. A vertical barrier consisting of a geomembrane would be installed to a depth of approximately 6 ft below grade along the southern property boundary. A groundwater pump and treat system would be installed upgradient of the vertical barrier to extract free product that may accumulate against the barrier and decrease the potential for contaminated groundwater to flow beneath and around the ends of the barrier. Pumped groundwater would be treated using carbon adsorption and discharged in accordance with an NPDES permit. Groundwater pumped from upgradient of the barrier will originate almost entirely from offsite. Because the upgradient source(s) have not been defined, the quantity of groundwater that may have to be pumped could be very large and may pose significant handling and treatment problems. Free product could also be skimmed from the wells installed upgradient of the vertical barrier.

The advantages of this alternative are: 1) it is implementable and would be effective for the site; 2) it would be protective of human health and the environment; 3) it would prevent free product from migrating onto the site; 4) it would restore the site to an un-impacted condition in a relatively short time period; and 5) it is the most comprehensive alternative and completely removes shallow contamination from the site.

The disadvantages of this alternative are: 1) if upgradient responsible parties initiated groundwater/free product remediation, the vertical barrier may hinder recovery efforts; 2) if a treatment system is installed using existing data, the treatment system may be undersized and not capable of handling a higher flux of contamination if concentrations increased; 3) the effectiveness of groundwater pumping to prevent contaminated groundwater from migrating beneath and around a vertical barrier has not been determined; and 4) this alternative is the most expensive alternative considered in this analysis.

6.0 SELECTION AND IMPLEMENTATION OF PROPOSED REMEDY

Based on the evaluation of the effectiveness, implementability, and cost of the five remedial alternatives, Alternative 3, Install and Operate Vapor Control/Monitoring System and Implement Institutional Controls, appears to be the best-suited remedial alternative for the site. The vapor control/monitoring system will be effective and can be implemented during construction operations for a reasonable cost. Based on the site conditions and results of this remedial alternative analysis, institutional controls and remedial measures that are recommended for the site are summarized in the following sections.

6.1 Institutional Controls

6.1.1 Prepare/Implement Construction Health and Safety Plan

As discussed above, conservative factors were assumed to calculate the risk to construction workers continuously involved with subsurface activities for one year at the site. Based on this evaluation, low risks were calculated. To further reduce this risk level, a health and safety plan will be prepared and implemented to ensure worker safety. The plan will require workers to have completed the OSHA 40-hour hazardous waste operations training and to wear personal protective equipment while performing subsurface work in identified "hot spot" zones. In addition, while work is performed in the hot spot zones, air monitoring will be conducted to ensure that workers employ the proper level of respiratory protection.

6.1.2 Prepare and Implement Construction Quality Assurance/Quality Control Plan

A construction quality assurance (CQA) plan will be prepared and implemented to ensure that the gas monitoring and control systems are constructed in accordance with the design, construction drawings, and technical specifications. The CQA plan will address three phases during the construction process; pre-construction, construction, and post-construction.

6.1.2.1 Pre-Construction Phase

The pre-construction phase CQA activities include a review of construction documents by the contractor, and establishment of responsibilities and lines of authority. At the outset, procedures for providing clear, open channels of communication for all parties involved with the construction will be outlined. This phase will also identify procedures for documenting construction of the gas monitoring and control systems.

6.1.2.2 Construction Phase

The construction phase CQA activities include observation, monitoring and documentation of the contractor's activities. The CQA plan will identify the critical steps involved with the construction and installation of the gas monitoring and control system.

6.1.2.3 Post-Construction Phase

The post-construction phase CQA activities include preparing the final CQA report and as-built drawings. The final CQA report will include a narrative describing the CQA activities, documentation of testing performed, and documentation of variances and design changes, if any. Additionally, the final CQA report will include pertinent project correspondence and material certifications.

6.1.3 Prepare and Implement Risk Management Plan

Because of potential risk of exposure to residual subsurface contamination at the site, a Risk Management Plan (RMP) will be implemented to further protect future Home Depot employees. The RMP will describe precautions that will be taken in the event that any post-development subsurface work is needed. This work could include repairing utilities or installing improvements with subsurface components. The RMP will be incorporated into Home Depot's standard worker health and safety program for the facility.

6.1.4 Implement Monitored Natural Attenuation/Perform Groundwater Monitoring

Following site development operations, groundwater monitoring will be performed. The objectives of the groundwater monitoring are to collect groundwater quality data and visual monitoring data downgradient of the impacted area in order to validate the results of groundwater modeling simulations, and to evaluate whether natural attenuation processes are occurring at the site by collecting constituent data inside and outside the impacted area.

Three downgradient wells and two upgradient or interior wells will be monitored. Well coverage will be selected to address the downgradient perimeter area and to document the chemical quality of groundwater within the impacted area.

BTEX will be analyzed to evaluate solubility and mobility considerations and to monitor potential plume migration. The intrinsic biodegradation parameters to be collected include dissolved oxygen, oxidation-reduction potential, pH, bicarbonate, alkalinity, sulfate, nitrate, and ferrous iron. Temperature and electrical conductivity will be collected in the field during groundwater sampling.

Groundwater monitoring will be performed on a quarterly basis for the first six months, and if the plume is stable, then semi-annually for the next 18 months. These data will be evaluated for trends in natural attenuation and plume stability. If the results indicate that natural attenuation processes are occurring, and there is no evidence of plume migration, the monitoring program will be reevaluated. The results of groundwater monitoring will be reported to DOH after each sampling event.

6.2 Engineering Controls

6.2.1 Install Cap Over Entire Site

A cap consisting of clean fill will be placed and compacted over the entire site to minimize contact with potentially contaminated soils during construction activities. In the area of the proposed store, the clean fill will be approximately 4 feet thick. The clean fill will then be covered with asphalt, concrete, and/or a geomembrane. The geomembrane, asphalt pavement, and/or concrete, will encapsulate the underlying contaminated soil and groundwater.

The cap will minimize the infiltration of surface water into the underlying contaminated soil, minimize potential contact with contaminated soil during construction, and act as a barrier to vertical gas migration.

6.2.2 Prepare and Implement Cap Maintenance Plan

As part of the operation and maintenance plan, a Cap Maintenance Plan will be prepared and implemented. This portion of the plan will outline steps that may be necessary to preserve the integrity of the cap and gas barrier materials.

6.2.3 Install Gas Control and Monitoring System

Based on the conservative assumptions used in calculating risk and an assumed infinite source of contamination from other properties upgradient of the site, there may be a minimal risk to indoor employees at the proposed Home Depot store who work there for 25 years and who inhale benzene vapors. In addition, the results of soil gas surveys performed in 1994 and October 1997 indicate that methane has accumulated in locations along the sewer line and identified hot spots. Even so, Home Depot has elected to install a gas control and monitoring system that will address both the benzene and methane matters to ensure that potential risks to employees are further reduced or eliminated.

The layout of the proposed gas control and monitoring system has been prepared (Attachment A). Beneath the proposed Home Depot store, the gas control system will consist of a geomembrane gas barrier system, and an air inlet/gas extraction piping system above the gas barrier. Beneath the proposed parking structure, the gas control system will consist of horizontal gas extraction and air inlet piping. The monitoring system for the proposed store and parking structure will be installed and designed to trigger operation of the gas extraction system if vapor concentrations exceed pre-determined levels.

6.2.4 Operate and Maintain Gas Control and Monitoring System

During the design life of the store, the gas control and monitoring system will be operated, as needed. This system will monitor gas concentrations beneath the store, parking structure, and asphalt areas where gas extraction systems will be installed. If action levels are reached at a monitoring system sampling location, the system will be designed and constructed to activate the gas extraction system and reduce the concentration within the gas extraction layer aggregate. Periodic maintenance will be performed, in accordance with the Operation and Maintenance Plan, to preserve the integrity of the gas control and monitoring system.

Vapors extracted during the operation of the gas control system could conceivably initiate cleanup of the site. The gas extraction system would be effective in removing volatile hydrocarbons from the subsurface beneath the parking lot that migrate to the collection system by diffusion. In addition, the oxygen provided by the air inlet piping may also promote and enhance natural biodegradation.

6.2.5 Install Gas Treatment System

If necessary, a gas treatment system will be designed, permitted and constructed prior to activation of the gas extraction system. The gas treatment system will be designed to treat the effluent stream in accordance with the DOH Clean Air Branch permit requirements.

6.2.6 Operate And Maintain Gas Treatment System

The gas treatment system will be operated, if required, while the gas extraction system is active. During times when the gas extraction system is not active, the gas treatment system will not be operational. Routine maintenance will be performed in accordance with the Operation and Maintenance Plan.

6.2.7 Prepare and Implement Operation and Maintenance Plan

An Operation and Maintenance Plan will be prepared and implemented for the gas control and monitoring system. This plan will outline operations and maintenance procedures that are required to preserve the integrity of the gas control and monitoring system. This plan will include procedures for monitoring the integrity of the asphalt pavement and concrete gas barrier or cap, monitoring equipment, and active gas extraction equipment. This plan may include procedures for gas analyzer maintenance, parts list for all system components, and procedures for sealing cracks in the pavement.

This plan will be in place prior to the completion of the construction. Modifications to this plan will be made based on experience gained during the installation of the system and routine maintenance.

6.2.8 Prepare and Implement Monitoring and Reporting Plan

A monitoring and reporting plan will be developed to address how and when to monitor the installed gas monitoring system and what reporting or notification will be necessary. The gas sensors located beneath the store, parking structure, and asphalt areas will be automatic and have a data-logging unit as a component of the system. Reporting the data obtained from the monitoring system and notifying the appropriate regulatory agencies of any action level exceedances will also be addressed in this plan.

This plan may include gas monitoring results and reporting formats and procedures, contingencies or response measures if threshold concentrations are exceeded, and procedures to notify appropriate regulatory agencies of conformance and non-conformance to regulations. This plan will be in place prior to the completion of the construction so that an initial baseline gas survey can be performed.

6.2.9 Perform Routine Monitoring and Reporting on Performance of Systems

After the gas control and monitoring system has been installed, periodic monitoring and reporting will be performed to verify that the system is functioning properly. This periodic monitoring may include the following: testing the system by injecting a known concentration of a contaminant at one of the sample collection points; verifying that the blower activates; verifying that the monitoring system is logging the correct data; and verifying that concentrations within the gas extraction layer are the same as the values reported by the gas monitoring system using a hand held instrument.

6.2.10 Prepare and Implement Gas Control and Monitoring System Contingency Plan, As Needed

A contingency plan will be prepared to address unanticipated gas control and monitoring system problems. This plan will be in place prior to the completion of the construction of the methane monitoring system. Modifications to this plan will be made based on experience gained during the installation of the system and routine maintenance.

7.0 RAM CHANGES

None at this time.

8.0 RESPONSIVENESS SUMMARY

The following is a summary of public questions and comments, with DOH responses.

8.1 Technical Issues

- Question: Why is bioremediation not being done? There are new biodegradable enzymes used to clean up contaminated service stations. Can they be used at this site?

  Response: These questions can be answered from two aspects. The first has to do with the risk-based approach to respond to environmental problems. A system has been developed and is being installed at the site which will satisfy and even exceed the State's standards for protection of human health and the environment. These State standards are applied uniformly to all land owners and operators in the State. The methods and systems being utilized at this site fall within the acceptable range of options for such protection. Bioremediation will, in fact, occur in the soil and ground water beneath the site.

From a scientific perspective, there are a number of remediation options which can be used to reduce levels of contamination. In the case of this particular site, it is located within a geographic area of known contamination which extends beyond the particular site's boundaries. There is an agreement with a technical work group (i.e. TWG) comprised of several major oil companies, Hawaiian Electric Company, and the State Department of Transportation, to accomplish investigations in the Iwilei area. Typically, any remediation method(s) eventually chosen should be applied to the entire area after an investigation of the source(s), the migration, and extent of contamination. The method(s) employed would have to be suitable to optimize the reduction of contamination, and therefore, the minimization of risk, across the entire geographic area. At the appropriate time, methods such as bioremediation may well be employed in the area, and this could include the below-ground areas under this particular site.

- Question: Could the methane gas cause an explosion?

  Response: A concentration of methane in the presence of oxygen could result in combustion of the methane. In a natural state, any escape of methane from the ground will be over a wide outdoors area, and it will be dispersed by wind and air movement. Thus, it would not be concentrated, but rather dispersed. The system designed as part of this project will accomplish two things: 1) it will prevent any release of methane into the confined space of the store; 2) additionally, should there be a concentration of methane below the structures on the site, it would be vented to the atmosphere by the vapor extraction system. The system is designed to prevent methane from becoming concentrated in a confined area, in the presence of oxygen.

- Question: Does groundwater flow affect the generation and distribution methane gas?

  Response: Methane is generated by the decomposition process of organic materials. It is most common in sanitary landfills, but it can also be generated in nature, and from decomposition of other organic materials. Groundwater flow, by itself, does not affect the generation or distribution of methane gas. However, it could affect the distribution of methane in the sense that it may transport organic materials (e.g., petroleum) that generate methane.

- Question: Will methane reach the extraction piping system?

  Response: Please see above discussion. It is unlikely that methane will reach the extraction system because the vapor barrier is intended to prevent migration upwards into the store. In the unlikely event that methane should reach the extraction piping system, then the extraction system will remove it.

- Question: Is the protective barrier and extraction system similar to systems used at landfills?

Response: Yes. The designers of the system at this site have drawn upon their experience with such sites in designing this protective system. Additionally, the concrete floor itself is part of the barrier system. Concrete slabs such as this are not normally used in landfill designs.

- Question: Could the methane gas be captured and used as a source of energy?

  Response: If there is significant generation of methane gas, systems can be designed to capture the gas for recycling and other purposes. In the case of this particular site, we do not anticipate that methane generation will even approach the amounts required to make practical use of it.

- Question: Is the Department of Health (DOH) confident that the methane concentration is low? Is it necessary to monitor methane concentrations?

  Response: All indications are that the methane concentrations at the site are low at the surface. As a precaution, there is a state-of-the-art detection system, with sensors installed throughout the store, that will detect methane in the unlikely event that it reaches that point.

- Question: Does the sewer line increase methane or cause other concerns related to methane production?

  Response: Response to questions above addresses the generation of methane. Similar to the discussion above, a sewer line could affect the distribution of methane in the sense that it may transport organic materials into the environment that generate methane should there be a pipeline release.

- Question: Can landscaping damage the geomembrane and compromise its effectiveness?

  Response: The geomembrane will be primarily beneath the store building. In any event, it will be installed at a depth which would make any damage from landscaping unlikely.

- Question: Is there any danger of an underground fire due to the contamination?

  Response: To have combustion, the combustible material must either contain or be in the presence of oxygen. For this reason, an underground fire event is extremely unlikely.

- Question: Is there a risk to workers from fugitive dust and vapor inhalation?

  Response: Typically, construction workers are exposed to a greater risk than the general public, or even employees at a site, from such things as vapors, dust, and dermal contact (i.e. contact with the skin). For this reason, the risk assessment fully evaluates such risks and prescribes the appropriate protection for construction workers doing work below the ground surface.

- Question: How are we protecting future generations from the dangers associated with the contamination?

  Response: The State DOH has promulgated, and enforces, human health and environmental standards which have specific risk based criteria. The risk assessment for this site, using very protective (i.e. conservative) assumptions, has shown that the systems provided as part of this project will meet or exceed the State's standards. Even if people were at this site, inside the building, for hours each day and for years on end, the risk assessment shows that the standards for protection are met or exceeded.
- Question: Is the plastic liner going to hold vapors and other contaminants under the building?

  Response: The membrane system is designed to prevent migration of vapors from any below-ground sources from entering the building. As an added precaution, if any such vapors should reach the space immediately below the building's concrete floor slab, then the vapor extraction system would vent such vapors to the atmosphere. This approach is accepted as a standard at sites throughout the U.S.

- Question: How will DOH assure that the protection system works properly and will continue to do so indefinitely? Is DOH going to monitor Home Depot's implementation and operation of protective systems? If so, for how long?

  Response: As part of the Voluntary Response agreement, Home Depot agrees to operate its systems and provide monitoring, and to provide reports to the DOH. It is in Home Depot's best interests to maintain and operate these systems because the primary protection is to its own employees. The risk assessment considers the potential exposure time for employees to be longer than for any of the public at large, and as stated in a prior response, the assumptions are very conservative (i.e. protective). It should be emphasized that even without the protective measures of vapor barrier membrane and vapor extraction system, it is not clear that employee health would be at risk. Nevertheless, because of the very protective nature of the risk assessment's assumptions, such systems are being provided by Home Depot. The result is that the State's applicable criteria are being met or exceeded by this system.

- Question: What is the geographical extent of the geomembrane and the protective system?

  Response: The geomembrane is provided under the store building primarily to provide an extra barrier to the possibility of vapor intrusion into a confined space. Since the parking structure is open to the air and wind action, the geomembrane is not being installed under the parking structure. Both the store and the parking structure will, however, have the vapor extraction system. This system will automatically operate at such time as vapors may be present beneath the concrete floor slab of both the store building, and the parking structure.

- Question: What is the groundwater flow at the site? Will heavy rains or the ocean influence it?

  Response: This site is considered to be near the coastline. Generally speaking, groundwater in Hawaii moves from the mountains or upland areas towards the ocean. Groundwater flow can be influenced by a number of things, including heavy rains and tidal action. Home Depot will periodically monitor contamination below the ground surface to provide the DOH with any indication of significant change. Based upon the history of past monitoring and sampling at this site, we do not anticipate significant changes to the conditions below this site.

8.2 Issues Related to Implementation of Hawaii Environmental Response Law

- Comment: Fees in the law discourage use of the Voluntary Response Program (VRP) by private citizens and small businesses.

  Response: DOH understands that program fees and other project costs are likely to be too high for private citizens and some small businesses. In Home Depot's case, and probably for the majority of subsequent VRP sites, program fees will be a very small percentage of the entire cost of a project. For this reason, part of the initial evaluation of the application form is to assess the applicant's ability to pay for the investigation and cleanup. It is likely that those who cannot afford the program fees also could not afford to pay for an investigation and cleanup, either during participation in the VRP, or should they be found liable for contamination in the future.

  It should also be recognized that potential costs to the State, which would take on any liability for contamination that was missed, may be much higher than the cost to the applicant. On the other hand, land owners successfully completing the program will benefit from increased property values, and lessees who successfully complete the program should be able to negotiate lower lease rents. DOH believes that increased property values and reduced lease rents will offset the cost of the program fees. In addition, all applicants participating in the program will receive direct oversight by a DOH project manager, which they otherwise may not receive. This results in quicker project review and completion, and fewer costly construction delays due to environmental issues.

- Comment: The VRP law allows exemptions for contamination that is cleaned up to a 1×10^{-6} (one in a million) excess cancer risk level. The Home Depot project is not designed to clean up the contamination, but to leave the contamination in place and protect the public and the environment from it. It does not seem that Home Depot would be eligible for an exemption from future liability.

  Response: The terms "clean up" or "cleanup" are not specifically defined under Chapter 128D, Hawaii Revised Statutes (HRS) or Chapter 11-451, Hawaii Administrative Rules (HAR). However, they are commonly used interchangeably with the term "response action," which has a broad meaning, and encompasses such options as capping and management-in-place. For example, Chapter 128D-4(a)(3) says the director may, "…solicit the cooperation of responsible parties prior to issuing an order to encourage voluntary *cleanup* efforts; and, if necessary, negotiate enforcement agreements with responsible parties to conduct needed *response actions* according to deadlines established in compliance orders or settlement agreements…(emphasis added)." Other examples from the HRS or HAR which clearly are not intended to limit the terms "clean up" or "cleanup" to the physical removal or destruction of contaminants include Chapter 128D-4(b)(3) and Chapter 11-451-3 "Interim remedial action." Additional examples can also be found throughout federal and State guidance documents.

- Question: Does the United States Environmental Protection Agency (EPA) or DOH mandate the Remedial Response Process? How often is it used in Hawaii?

  Response: There are two processes followed by both EPA and DOH to abate or mitigate a threat to human health or the environment, called the "removal" and "remedial" response processes. DOH has modeled their processes after EPA's, with some modifications intended to streamline implementation. To the extent practical, and given the circumstances present, the HEER Office will, at it's discretion, utilize the removal process to address the entire release or threat of release present at a site. The remedial process is generally followed for sites at which extensive groundwater contamination exists, complex mixtures of chemicals are present, the number and complexity of cleanup alternatives that need to be evaluated are great, or there is a higher degree of public participation activities required prior to selection and implementation of the response action. The HEER Office estimates that the removal process is applicable to more than 75% of the sites addressed by the HEER Office.

- Question: Where is this site in the Remedial Response Process?

  Response: The Remedial Investigation (RI), Remedial Alternatives Analysis (RAA), and Draft Response Action Memorandum (RAM) have been completed. The soil/soil-vapor remediation and monitoring system have been designed and installed. However, the groundwater monitoring system needs to be designed and installed before a letter of completion will be issued.

- Question: Is an Environmental Impact Statement (EIS) required for this site and if so what is its status?

  Response: An EIS is not required for this site, nor an Environmental Assessment (EA).

8.3 Issues Related to Fairness and Preferential Treatment

- Question: Why were building permits issued and construction begun before DOH made its final decision regarding this project?

  Response: Home Depot's participation in the VRP is strictly voluntary, and DOH's final approval of the response action is not required. This question raises an important point about the VRP: Chapter 128D, HRS does not necessarily require that Home Depot conduct an environmental investigation or a response action prior to developing the property. However, if the property is developed and environmental problems are later discovered at the property, Home Depot could be held fully liable for taking the action needed to protect public health and the environment. By successfully completing the VRP, the law allows Home Depot to obtain an exemption from future liability to the State. Therefore, if Home Depot decides to develop the property and DOH does not ultimately approve the voluntary reponse action, Home Depot would either need to revise its response action or forfeit the potential exemption from future liability. This is a risk that Home Depot is taking in developing the property prior to a final decision from DOH.

- Question: Why has construction already begun, and this is the first public meeting?

  Response: Home Depot has decided to develop the property and participate in the VRP simultaneously. This is understandable since time can be a critical factor in successfully developing a property. Home Depot's participation in the VRP is voluntary, and a final approval of the voluntary response action is not required prior to development. The public meeting was not about approving the construction of a Home Depot store. Rather, it was about approving the voluntary reponse action proposed by Home Depot. Thus, Home Depot is taking a risk in developing the property prior to a final decision from DOH since, if DOH does not ultimately approve the response action, Home Depot would either need to revise its response action or forfeit the exemption from future liability.

- Comment: Many local small businesses (such as service stations) have been forced out of business because they were required to do costly cleanups of environmental contamination. It seems that Castle & Cooke should be required to cleanup the property before it is redeveloped.

  There is no question that environmental problems can be very costly, and it is not unlikely that an environmental cleanup could cause a business with limited resources to close. The cost for Home Depot to address the contamination at this site is over 1.5 million dollars. There are probably very few small businesses with the kinds of resources necessary to implement a control and monitoring system of this nature or develop this property. It is also worth noting that Home Depot did not cause the contamination that necessitated this response action, and such is probably not the case with most gas stations owners who have been required to conduct environmental cleanups.

  The circumstances at this property are complicated by the fact that it is situated in an area where contamination is widespread and the sources have not been determined. Even if Castle & Cooke were to clean up the property, the end result may not be protective of human health and the environment because the property would likely be re-contaminated. Until the sources have been located and removed, it is more effective to prevent exposure to the contaminated soil, and to control the movement of vapors and contaminated groundwater. This will require significant effort on the part of Home Depot. At a minimum, this will require a semi-permanent barrier over the contaminated soil; a vapor control, extraction, and monitoring system over the entire area; a groundwater monitoring system; and contingency plans to contain the contamination should one or more of the monitoring systems indicate that people or the environment could be exposed to contaminants.

Concurrent with the proposed Home Depot development, is an investigation in the Iwilei area to determine the sources, nature, and extent of contamination. This work is being conducted under an agreement between the Department of Health and a technical work group (i.e., the TWG) consisting of several major oil companies, Hawaiian Electric Company, and the Department of Transportation. The Department's ultimate goal is to comprehensively address the area-wide contamination issue.

- Question: What is the federal mandate for service stations and how does it relate to the mandate for the Home Depot site?

  Response: Service stations and all owners and operators of underground storage tanks (USTs) are mandated to meet certain design standards and have leak detection systems for their USTs, and to respond to suspected or known leaks with investigative and remedial measures (see Title 40, Code of Federal Regulations, Part 280). To minimize the burden placed on owners and operators of USTs, some requirements were phased in over a period of 10 years, the last deadline being December 1998. Monetary penalties for non-compliance can be assessed, and cleanup costs can be recovered by the implementing agency. On the other hand, the VRP is not mandated by either the federal government or the State. It is purely voluntary, and based on the incentive of gaining a waiver from future liability, rather than the disincentive of fines, penalties, and recovery of cleanup costs.

- Comment: The Department is being biased and campaigning for Home Depot and Castle & Cooke in whitewashing the severe pollution problem at the Home Depot site and the entire Iwilei District.

  Response: DOH recognizes that soil and groundwater at the Home Depot site, and a large portion of the Iwilei District, are highly contaminated with petroleum and related constituents. However, DOH believes that until the sources have been located and removed, it is more effective to prevent exposure to the contaminated soil, groundwater, and vapors (see response to Comment 3c). The proposed response action is based on substantial and well-documented analyses of site risks and various remedial alternatives, and not bias on the part of DOH toward Home Depot, Castle & Cooke, or "big industry."

- Comment: It is not fair that Castle & Cooke and other large corporations can contaminate property and then not be required to completely remove the contamination. Instead they go on to profit greatly from the property before the problem is properly remedied. This approach to addressing the contamination sets a bad precedent which others will be allowed to follow.

  Response: The scope of DOH's mandate is limited to protecting human health and the environment. Therefore, DOH has adopted a risk-based corrective action (RBCA) policy, which means that remedial action objectives are based on actual or potential risk to human health and the environment, not arbitrary, overly conservative, and oftentimes unobtainable criteria. The purpose of the policy is to allow for more efficient allocation of limited resources at contaminated sites by ensuring that the cleanup requirements applied to a site are appropriate for the degree of actual or potential risk posed by that site. Based on the expected future land use at this site (i.e., industrial/commercial), it is not necessary to return subsurface soil and groundwater to pristine conditions in order to protect human health and the environment.

8.4 Issues Related to Area-Wide Contamination

- Question: What ranking has DOH given the site?

  Response: The Home Depot "site" is actually a "subsite" of Honolulu Harbor, which is being addressed under an agreement between DOH and a technical work group (the TWG) consisting of several major oil companies, Hawaiian Electric Company, and the Department of Transportation. The Honolulu Harbor site has been ranked a medium priority.

- Question: What is the status of the area wide investigation?

  Response: The Honolulu Harbor agreement covers Phase I of the investigation. The purpose of Phase I is to: evaluate and integrate existing data for the characterization of the nature and extent of petroleum contamination of soil and groundwater at the site; and develop a preliminary Conceptual Site Model (CSM), including an assessment of probable complete exposure pathways, that is consistent with EPA guidelines. The results of the Phase I work will be used by DOH to determine the level of effort required for further investigations, locate data gaps, and identify and pursue uncooperative responsible parties. In addition to the Phase I investigation, the TWG is currently working to address petroleum seepages into Honolulu Harbor near Pier 26. An environmental firm has been selected, and work to stop the seepages has begun.

- Comment: New development in the Iwilei District will create barriers to a proper and comprehensive remediation to the entire area of contamination.

  Response: This has been of some concern to DOH. However, at the Home Depot site, this is not expected to be a significant problem. Adequate control of contaminant migration can be obtained from areas adjacent to the cap and vapor control system. Should it be necessary, recent advances in technology (e.g., horizontal drilling) will allow removal or destruction of contaminants from soils and groundwater underneath obstructions.

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FIGURES

TABLES